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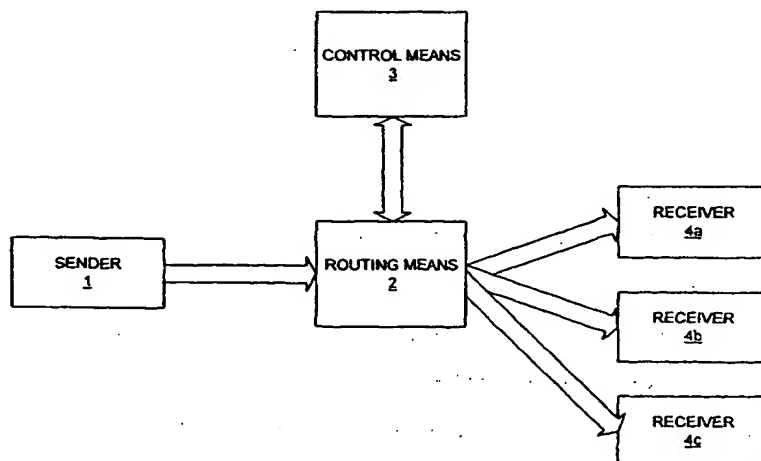
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(54) Title: IN CONTROLLED MULTICAST



(57) Abstract: According to the present invention a method and an apparatus in a packet-switched network for supplying data packets to receivers (4a-c) belonging to a multicast group are disclosed. The apparatus comprises a routing means (2) for receiving data packets from a sender (1) and for buffering data packets the destination address of which is a multicast address of a multicast group. The apparatus further comprises a control means (3) communicating with the routing means (2) for determining the addresses of the receivers (4a-c) of the multicast group indicated by the multicast address and receiver-specific parameters, for designating filters for each receiver (4a-c) and/or each determined receiver address in accordance with the receiver-specific parameters and for supplying the determined addresses and designated filters to the routing means (2). The routing means (2) filters the multicast data packets and/or the determined addresses with the designated filters for each receiver (4a-c) of the multicast group and supplies the filtered multicast data packets to the filtered receiver addresses.

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TITLE OF THE INVENTION

IN controlled multicast.

5 FIELD OF THE INVENTION

The present invention relates to multicast address mapping in a packet-switched network, and in particular to a method and an apparatus in a packet-switched network for supplying data
10 packets to receivers belonging to a multicast group.

BACKGROUND OF THE INVENTION

Multicast is a point to multipoint service in a network where
15 different subscribers have to subscribe to a multicast group. Multicast technique generally is used by applications that want to reach a group of like-minded receivers who normally are not known by the sender in advance.

20 Multicast technique is well suitable for radio or TV broadcasting. Transmission of sound or image will become popular also in a wireless network in future when the UMTS (Universal Mobile Telecommunications System) technology will provide needed capacity. A multicast address identifies a
25 group of interfaces or subscribers. Data packets that are sent to a multicast address are supplied to all of the interfaces or subscribers of the group by means of the Internet Group Management Protocol (IGMP).

30 However, according to conventional multicast technique it is not possible to consider different needs of different subscribers belonging to a multicast group.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to solve the above-mentioned problem and to enable different manipulation of multicast data packets for different receivers belonging to a multicast group.

5

According to a first aspect of the present invention this object is achieved by a method in a packet-switched network for supplying data packets to receivers belonging to a multicast group, comprising the steps of:

- 10 receiving data packets from a sender;
- buffering data packets the destination address of which is a multicast address of a multicast group;
- determining the addresses of the receivers of the multicast group indicated by the multicast address and
- 15 determining receiver-specific parameters;
- filtering the multicast data packets in accordance with the receiver-specific parameters for each receiver of the multicast group; and
- supplying the filtered multicast data packets to the
- 20 determined receiver addresses.

Furthermore, according to the first aspect, the object is achieved by an apparatus in a packet-switched network for supplying data packets to receivers belonging to a multicast group, comprising:

- 25 a routing means for receiving data packets from a sender and for buffering data packets the destination address of which is a multicast address of a multicast group; and
- a control means communicating with the routing means for
- 30 determining the addresses of the receivers of the multicast group indicated by the multicast address and receiver-specific parameters, for designating filters for each receiver in accordance with the receiver-specific parameters and for supplying the determined addresses and designated
- 35 filters to the routing means;

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wherein the routing means filters the multicast data packets with the designated filters for each receiver of the multicast group and supplies the filtered multicast data packets to the determined receiver addresses.

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According to a second aspect of the present invention, the above-mentioned object is achieved by a method in a packet-switched network for supplying data packets to receivers belonging to a multicast group, comprising the steps of:

- 10 receiving data packets from a sender;
 buffering data packets the destination address of which
 is a multicast address of a multicast group;
 determining the addresses of the receivers of the
 multicast group indicated by the multicast address and
15 determining receiver-specific parameters;
 filtering the determined addresses in accordance with
 the receiver-specific parameters; and
 supplying the multicast data packets to the filtered
 receiver addresses.

20

Furthermore, according to the second aspect, the object is achieved by an apparatus in a packet-switched network for supplying data packets to receivers belonging to a multicast group, comprising:

- 25 a routing means for receiving data packets from a sender
 and for buffering data packets the destination address of
 which is a multicast address of a multicast group; and
 a control means communicating with the routing means for
 determining the addresses of the receivers of the multicast
30 group indicated by the multicast address and receiver-
 specific parameters, for designating filters for each
 determined receiver address in accordance with the receiver-
 specific parameters and for supplying the determined
 addresses and designated filters to the routing means;
35 wherein the routing means filters the determined
 addresses with the designated filters for each receiver of

the multicast group and supplies the multicast data packets to the filtered receiver addresses.

With the IN controlled multicast addressing to subscribers of
5 a multicast group according to the present invention
subscriber-specific restrictions or exceptions can be set.
For example, multicast data packets can be allowed to be sent
to a receiver according to a time schedule. Also a content of
data packets can be matched to the capability of a receiver.
10
Further features of the present invention are defined in the
dependent claims.

In the following the present invention will be described by
15 way of preferred embodiments thereof with reference to the
accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

20 Fig. 1 shows a schematic block diagram of the basic
components of a system according to the present invention;

Fig. 2 shows a flowchart of an operation of a routing means
and a control means of Fig. 1 according to a first embodiment
25 of the present invention; and

Fig. 3 shows a flowchart of an operation of the routing means
and control means of Fig. 1 according to a second embodiment
of the present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The idea of the present invention is to provide Intelligent
Network (IN) control for the multicast service.

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Fig. 1 shows a schematic block diagram of the system according to the present invention. For purpose of simplification merely the basic components of the system are shown in the diagram.

5

A sender 1 sends data packets to a routing means 2 in a packet-switched network. For example, the routing means 2 can be an Internet router or a proxy server. In case the sender 1 sends data packets to a multicast address indicating a
10 multicast group the routing means 2 has to route the data packets to the members of the multicast group, for example to receivers 4a to 4c. A receiver belonging to a multicast group may be a UMTS subscriber in a GSM (Global System for Mobile communications) network.

15

However, each receiver 4a-c may have specific needs with respect to data communications. Thus, according to the present invention, a control means 3 such as an SCP (Service Control Point) is provided for the routing means 2. The
20 control means 3 stores tables of addresses of receivers belonging to multicast groups and specific filtering parameter of these receivers in a table in advance. The parameters can be references to predefined filtering algorithms, address of an external filter device or specific
25 filtering rules. The predefined algorithms can include image filtering, advertisement filtering, etc.

When the routing means 2 receives data packets which destination address is a multicast address addressing the
30 receivers 4a-c it buffers these multicast data packets and communicates the multicast address to the control means 3 in order to fetch the address list of the receivers belonging to the detected multicast group. Moreover, the routing means 2 is able to check the data packets on certain contents or data
35 amount and communicate the results to the control means 3.

The control means 3 determines the addresses of the receivers belonging to the multicast group indicated by the multicast address by using the stored tables, i.e. the control means 3
5 prepares the receiver list for the multicast address. For example, the control means 3 determines the addresses of the receivers 4a-c which belong to the same multicast group. Then the control means determines specific parameters of each receiver 4a-c by searching the stored table in which the
10 specific parameters for the receivers of this multicast group are defined, i.e. the control means 3 checks filtering parameters for each receiver of the prepared receiver list. On the basis of the determined receiver-specific filtering parameters and taking into account the checking results
15 communicated by the routing means 2, the control means 3 designates a filter or filtering rules for each receiver 4a-c and communicates the list of receiver addresses and the filtering rules per address to the routing means 2. According to SCP implementation, service logic programs in the SCP
20 effect this operation.

The routing means 2 filters the data packets for each of the receivers 4a-c according to the designated filter for each receiver 4a-c and transmits the packets to the receivers 4a-c
25 if the packets pass the filter. In this way the data packets can be modified for each receiver 4a-c according to its needs defined in the receiver-specific parameters. This filtering function may be integrated in the routing means or, alternatively, in a separated device, e.g. in a proxy.

30

It is also possible to filter the addresses of the receivers belonging to a multicast group. The control means 3 can designate filters for the receiver addresses so that the routing means does not route any data packets to receivers
35 which addresses are filtered out.

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The receiver-specific filtering parameters may be dependent on receiver conditions or capabilities, including for example reachability of the receiver, available bandwidth, type of terminal screen such as big/small, color/monochromatic, graphical/text and the like.

In the following a first embodiment of the present invention will be described with reference to Fig. 2. According to the first embodiment of supplying multicast data packets, these packets can be modified by means of filters designated by the control means 3 for each receiver 4a-c.

In a first step S21 data packets are received by the routing means 2 from the sender 1. In case the data packets are sent to a multicast address by the sender the multicast data packets are buffered in the routing means 2 in step S22. Then the addresses of the receivers 4a-c of the multicast group indicated by the multicast address are determined in step S23. Furthermore, in step S23, the receiver-specific parameters are determined. As described before, the determination is carried out by the control means 3 providing the list of receiver addresses which may include the receiver-specific filtering parameters to the routing means 2.

In step S24 the multicast data packets are filtered in accordance with the determined receiver-specific parameters for each receiver 4a-c of the multicast group. That is, filters are designated for each receiver 4a-c on the basis of the receiver-specific parameters and the data packets are modified using the filters. Finally, the modified or filtered multicast data packets are supplied to the respective receivers 4a-c.

35

The receiver-specific parameters can indicate a certain content of data packets that is not to be received by a specific receiver or a data amount of a certain content of data packets which data amount is not to be received by a specific receiver. For example, a multicast receiver 4a that is roaming in a GSM network may have not enough capacity to handle images. Thus, it has indicated in its parameters that it does not want to receive any images. When the control means 3 determines the address of the receiver 4a and its parameters in step S23 it designates a filter for filtering out image data from the multicast data packets and supplies this filter information to the routing means 2. The routing means 2 filters the data packets for the receiver 4a so that no images are present in the filtered data packets and supplies the filtered packets to the receiver 4a.

In this context the receiver 4a can indicate in its parameters that it does not want to receive images only when it is roaming in the network. In this case the control means 3 checks the conditions of the receiver 4a and designates the filter accordingly. Moreover, certain time intervals can be indicated in the receiver-specific parameters in which time intervals certain contents are not to be received by the receiver.

25

In the following, a second embodiment of the present invention will be described with reference to Fig. 3. According to the second embodiment of supplying multicast data packets, addresses of receivers belonging to a multicast group can be filtered out so that specific receivers do not receive any multicast data packets.

In step S31 data packets are received by the routing means 2 from the sender 1. In case the data packets are sent to a multicast address they are buffered in the routing means 2 in step S32. In step S33 the receiver addresses and receiver-

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specific parameters are determined by the control means 3 and transmitted to the routing means 2. Moreover, in step S33 certain contents or a data amount of the multicast data packets can be checked by the routing means 2 and the results are communicated to the control means 3. In step S34 the determined addresses of the receivers 4a-c belonging to the multicast group are filtered. To be precise, the control means 3 designates filters for each receiver 4a-c on the basis of the receiver-specific parameters. In designating the filters, the control means 3 can also consider the results about a certain content or data amount of the multicast data packets. The control means 3 communicates the filter information to the routing means 2 which filters the receiver addresses using this filter information and supplies the multicast data packets to the filtered receiver addresses in step S35.

For example, the receiver 4b can indicate in its parameters that it does not want to receive data packets during a certain time interval. Thus, when the control means 3 determines the address of the receiver 4b and its parameters in step S33 it checks time and date. If the multicast data packets would be sent in the excluded time interval the control means designates the filter information so that the address of the receiver 4b is filtered out by the routing means 2.

Furthermore, the receiver 4c may indicate in its parameters that it does not want to receive any advertisement. When the control means 3 determines the address of the receiver 4c and its parameters in step S33 it detects that a certain content of data packets, i.e. advertisement, is not to be received by the receiver 4c. Therefore, the control means 3 requests the routing means 2 to check the content of the buffered data packets. Thereupon the routing means 2 checks the content and communicates the results to the control means. In case the

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content is advertisement, the control means 3 designates the filter for the receiver 4c such that its address is filtered out so that the data packets are not routed to the receiver 4c.

5

The receivers can also indicate a certain data amount of data packets which is not to be received. In addition, the receivers can indicate a certain data amount of a certain content which data amount is not to be received. The routing means 2 may check the content and data amount always when buffering the multicast data packets or on request.

10

As it is obvious for a person skilled in the art the features of the first and second embodiments can be combined. For example, when the routing means 2 receives multicast data packets from the sender 1 it supplies modified multicast data packets to the receiver 4a, no multicast data packets to the receiver 4b, i.e. the address of the receiver 4b is filtered out, and unchanged multicast data packets to the receiver 4c.

15
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The routing means 2 may recognize multicast data packets on the basis of their multicast address. Alternatively, this recognition may also be performed on an upper protocol level by interpreting certain messages like the HTTP/SMTP (Hyper Text Transfer Protocol/Simple Mail Transfer Protocol) push message out of the data packets by the routing means.

25

With the IN controlled multicast addressing to subscribers of a multicast group according to the present invention subscriber-specific restrictions or exceptions can be set. For example, multicast data packets can be allowed to be sent to a receiver according to a time schedule. Also a content of data packets can be matched to the capability of a receiver.

30

According to the present invention a method and an apparatus in a packet-switched network for supplying data packets to

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receivers belonging to a multicast group are disclosed. The apparatus comprises a routing means for receiving data packets from a sender and for buffering data packets the destination address of which is a multicast address of a

5 multicast group. The apparatus further comprises a control means communicating with the routing means for determining the addresses of the receivers of the multicast group indicated by the multicast address and receiver-specific parameters, for designating filters for each receiver and/or

10 each determined receiver address in accordance with the receiver-specific parameters and for supplying the determined addresses and designated filters to the routing means. The routing means filters the multicast data packets and/or the determined addresses with the designated filters for each

15 receiver of the multicast group and supplies the filtered multicast data packets to the filtered receiver addresses.

While the invention has been described with reference to preferred embodiments, the description is illustrative of the

20 invention and is not to be construed as limiting the invention. Various modifications and applications may occur to those skilled in the art without departing from the true spirit and scope of the invention as defined by the appended claims.

CLAIMS:

1. A method in a packet-switched network for supplying data
packets to receivers (4a-c) belonging to a multicast group,
5 comprising the steps of:
 receiving (S21) data packets from a sender (1);
 buffering (S22) data packets the destination address of
 which is a multicast address of a multicast group;
 determining (S23) the addresses of the receivers (4a-c)
10 of the multicast group indicated by the multicast address and
 determining receiver-specific parameters;
 filtering (S24) the multicast data packets in accordance
 with the receiver-specific parameters for each receiver (4a-
 c) of the multicast group; and
15 supplying (S25) the filtered multicast data packets to
 the determined receiver addresses.
2. The method according to claim 1, wherein the receiver-
specific parameters indicate a certain content of data
20 packets that is not to be received by the specific receiver.
3. The method according to claim 1, wherein the receiver-
specific parameters indicate a data amount of a certain
content in data packets which data amount is not to be
25 received by the specific receiver.
4. The method according to claim 2 or 3, wherein the certain
content is filtered out in the filtering step (S24).
- 30 5. The method according to claim 2 or 3, wherein the
receiver-specific parameters are dependent on receiver
conditions.
6. A method in a packet-switched network for supplying data
35 packets to receivers (4a-c) belonging to a multicast group,
comprising the steps of:

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receiving (S31) data packets from a sender (1);
buffering (S32) data packets the destination address of
which is a multicast address of a multicast group;

determining (S33) the addresses of the receivers (4a-c)
5 of the multicast group indicated by the multicast address and
determining receiver-specific parameters;

filtering (S34) the determined addresses in accordance
with the receiver-specific parameters; and

supplying (S35) the multicast data packets to the
10 filtered receiver addresses.

7. The method according to claim 6, wherein the determining
step (S33) includes the further step of:

detecting contents and a data amount of data packets,
15 and wherein the filtering step (S34) includes the further
step of:

filtering the determined addresses in accordance with
the detected results.

20 8. The method according to claim 6, wherein the receiver-
specific parameters indicate a certain time at which no data
packets are to be received by the specific receiver.

9. The method according to claim 8, wherein when the certain
25 time is detected in the determining step (S33) the address of
the specific receiver is filtered out in the filtering step
(S35).

10. The method according to claim 7, wherein the receiver-
30 specific parameters indicate a certain content of data
packets that is not to be received by the specific receiver.

11. The method according to claim 7, wherein the receiver-
specific parameters indicate a certain data amount of data
35 packets which is not to be received by the specific receiver.

12. The method according to claim 10, wherein when the certain content is detected in the detecting step the address of the specific receiver is filtered out in the filtering step (S35).

5

13. The method according to claim 11, wherein when the certain data amount is detected in the detecting step the address of the specific receiver is filtered out in the filtering step (S35).

10

14. The method according to any one of claims 8, 10 and 11, wherein the receiver-specific parameters are dependent on receiver conditions.

15 15. An apparatus in a packet-switched network for supplying data packets to receivers (4a-c) belonging to a multicast group, comprising:

20 a routing means (2) for receiving data packets from a sender (1) and for buffering data packets the destination address of which is a multicast address of a multicast group; and

25 a control means (3) communicating with the routing means (2) for determining the addresses of the receivers (4a-c) of the multicast group indicated by the multicast address and receiver-specific parameters, for designating filters for each receiver (4a-c) in accordance with the receiver-specific parameters and for supplying the determined addresses and designated filters to the routing means (2);

30 wherein the routing means (2) filters the multicast data packets with the designated filters for each receiver (4a-c) of the multicast group and supplies the filtered multicast data packets to the determined receiver addresses.

35 16. The apparatus according to claim 15, wherein the receiver-specific parameters indicate a certain content of

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data packets that is not to be received by the specific receiver.

17. The apparatus according to claim 15, wherein the
5 receiver-specific parameters indicate a data amount of a certain content in data packets which data amount is not to be received by the specific receiver.

18. The apparatus according to claim 16 or 17, wherein the
10 certain content is filtered out by the routing means (2).

19. The apparatus according to claim 16 or 17, wherein the receiver-specific parameters are dependent on receiver conditions.

15

20. The apparatus according to claim 15, wherein the control means (3) determines the receiver addresses and receiver-specific parameters by means of tables stored in the control means.

20

21. An apparatus in a packet-switched network for supplying data packets to receivers (4a-c) belonging to a multicast group, comprising:

25 a routing means (2) for receiving data packets from a sender (1) and for buffering data packets the destination address of which is a multicast address of a multicast group; and

30 a control means (3) communicating with the routing means (2) for determining the addresses of the receivers (4a-c) of the multicast group indicated by the multicast address and receiver-specific parameters, for designating filters for each determined receiver address in accordance with the receiver-specific parameters and for supplying the determined addresses and designated filters to the routing means (2);

35 wherein the routing means (2) filters the determined addresses with the designated filters for each receiver (4a-

c) of the multicast group and supplies the multicast data packets to the filtered receiver addresses.

22. The apparatus according to claim 21, wherein the routing
5 means (2) detects contents and a data amount of data packets and communicates the results to the control means (3) which designates the filters also in accordance with these results.

23. The apparatus according to claim 21, wherein the
10 receiver-specific parameters indicate a certain time at which no data packets are to be received by the specific receiver.

24. The apparatus according to claim 23, wherein when the
certain time is detected by the control means (3) the address
15 of the specific receiver is filtered out by the routing means (2).

25. The apparatus according to claim 22, wherein the
receiver-specific parameters indicate a certain content of
20 data packets that is not to be received by the specific receiver.

26. The apparatus according to claim 22, wherein the
receiver-specific parameters indicate a certain data amount
25 of data packets which is not to be received by the specific receiver.

27. The apparatus according to claim 25, wherein when the
certain content is detected by the routing means (2) the
30 address of the specific receiver is filtered out by the routing means (2).

28. The apparatus according to claim 26, wherein when the
certain data amount is detected by the routing means (2) the
35 address of the specific receiver is filtered out by the routing means (2).

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29. The apparatus according to any one of claims 23, 25 and 26, wherein the receiver-specific parameters are dependent on receiver conditions.

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30. The apparatus according to claim 21, wherein the control means (3) determine the receiver addresses and receiver-specific parameters by means of tables stored in the control means.

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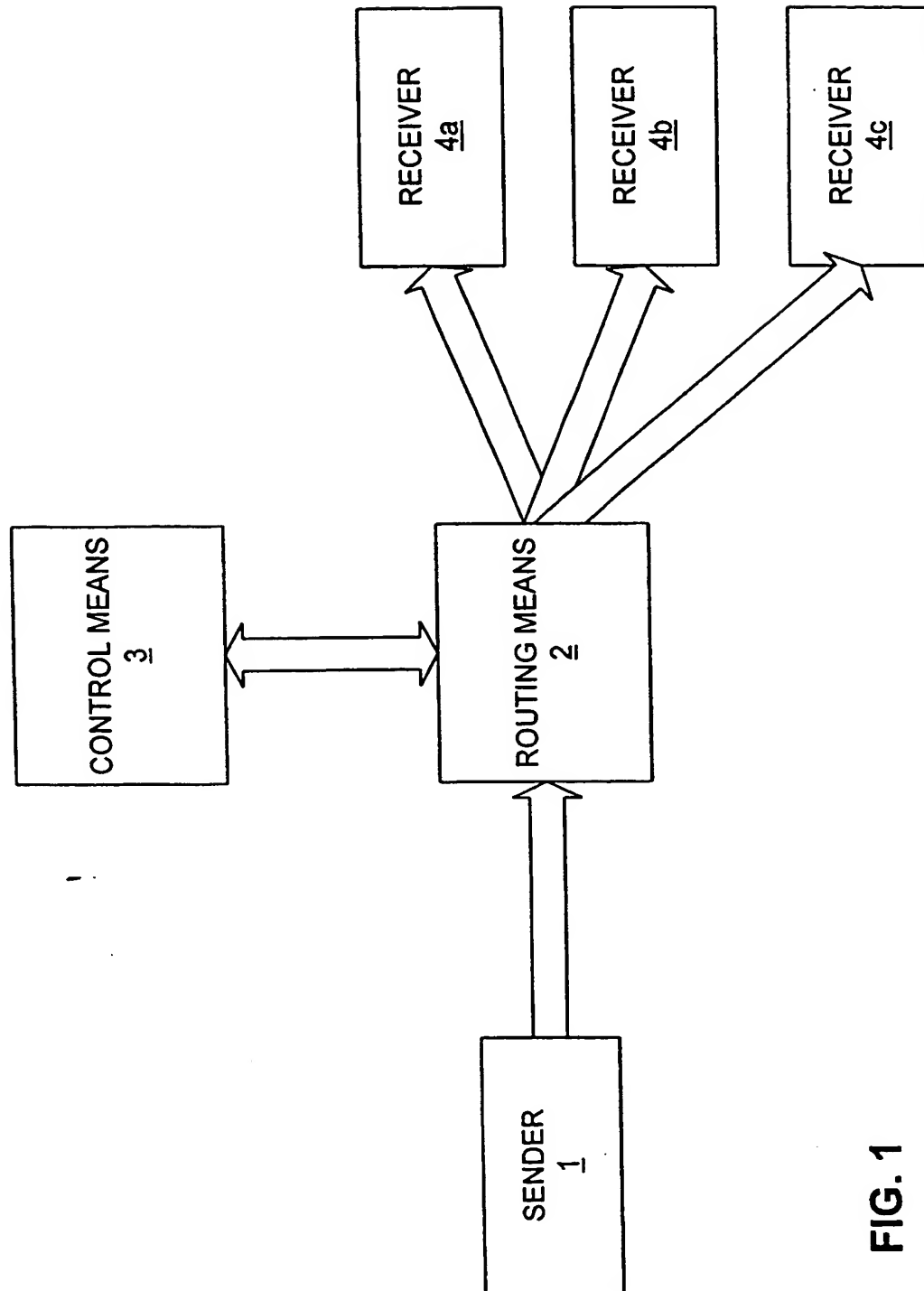


FIG. 1

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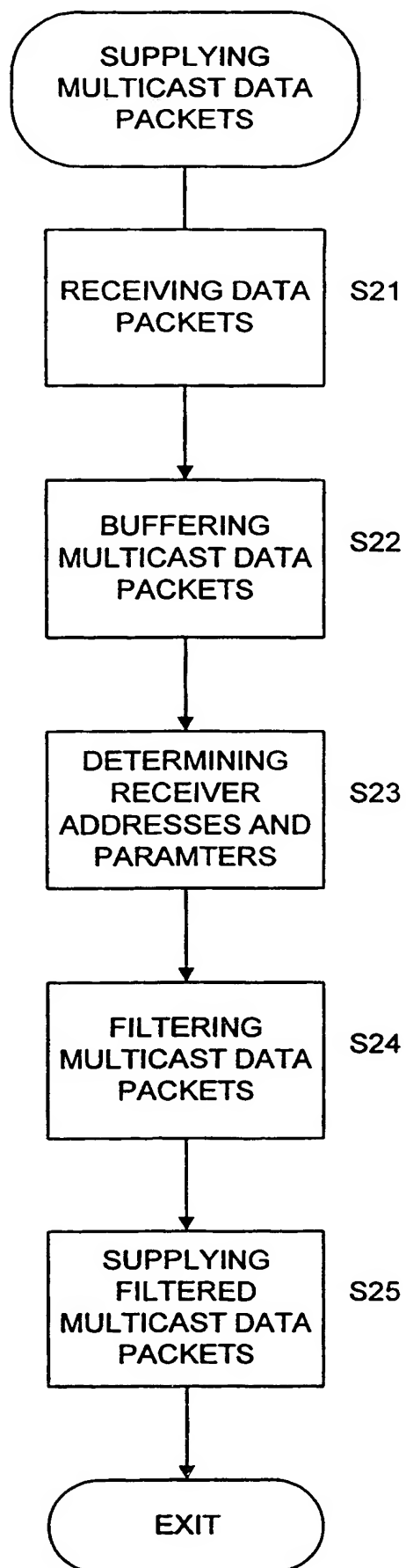


FIG. 2

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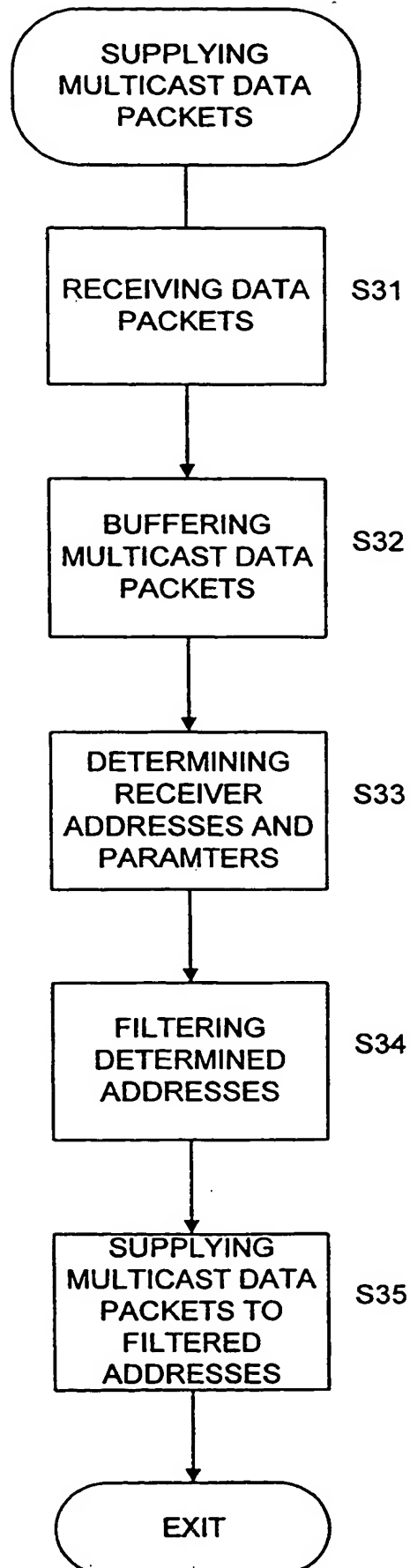


FIG. 3

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 99/06660

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>JIANZHONG ZHOU: "Heterogeneous multicasting based on RSVP and QoS filters" COMMUNICATION TECHNOLOGY PROCEEDINGS, 1998, 'Online! vol. 2, 22 - 24 October 1998, pages 1-8, XP002140105 ICCT '98 ISBN: 7-80090-827-5 Retrieved from the Internet: <URL:www.iel.ihs.com> 'retrieved on 2000-06-14! abstract page 1, line 22 -page 2, line 3 page 5, line 12 - line 27 page 6; figure 4</p> <p style="text-align: center;">-/-</p>	1-30

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search

14 June 2000

Date of mailing of the international search report

28/06/2000

Name and mailing address of the ISA

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Authorized officer

Adkhis, F

INTERNATIONAL SEARCH REPORT

Original Application No

PCT/EP 99/06660

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5 933 605 A (IIZUKA TAMIO ET AL) 3 August 1999 (1999-08-03) abstract column 1, line 6 -column 19 column 2, line 4 -column 3, line 8 column 3, line 28 - line 33</p>	1-30
A	<p>YEADON N ET AL: "FILTERS: QOS SUPPORT MECHANISMS FOR MULTIPLE COMMUNICATIONS" IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS,US,IEEE INC. NEW YORK, vol. 14, no. 7, 1 September 1996 (1996-09-01), pages 1245-1262, XP000626275 ISSN: 0733-8716 abstract page 1245, right-hand column, line 14 - line 20 page 1248, left-hand column, line 5 - line 34 page 1249, right-hand column, line 37 -page 1250, right-hand column, line 18 page 1251, right-hand column, line 5 -page 1252, left-hand column, line 6</p>	1-30

INTERNATIONAL SEARCH REPORT

information on patent family members

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